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Biological and Pharmacological Properties of *Abroma augusta* Linn. Seed Oil

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Abstract: The seed oil of *Abroma augusta* Linn. was studied for biological and pharmacological properties. The oil was also screened for various *in vitro* biological and pharmacological activities including antifungal, antibacterial, insecticidal, phytotoxic and brine-shrimp cytotoxic activities. The oil exhibited remarkable phytotoxic activity against *Lemna aeguinoctailis* Welve. It was also explored to posses moderate antifungal activities against *Trichophyton schoenleinii* (56%) (human pathogens) and *Microsporum canis* (50%) (animal pathogen). The *Abroma augusta* seed oil did not shows the significant antibacterial, insecticidal activities and Brine shrimp cytotoxicity.

Key words: *Abroma augusta*, biological activities, phytotoxicity, antifungal activities

Introduction

Abroma augusta Linn (Sterculiaceae), commonly known as Ulatkambal (Bengali and Hindi), is a large spreading bushy shrub with fibrous barks and irritant hairs, widely distributed (native or cultivated) throughout the hotter parts of India, in U.P., Sikkim (3,000 ft.), Khasia Hills (4,000 ft.) and Assam. The fresh viscid sap of the root bark is considered to be a valuable emmenagogue and uterine tonic, useful in the congestive and neuralgic varieties of dysmenorrhoea, (Kirtikar and Basu, 1918). `Minofil', an herbal formulation containing *Abroma augusta* may be an alternative to HRT in the treatment of post menopausal syndrome (Nanda, 1997).

The current studies were undertaken to explore the oil seed of *Abroma augusta* for various pharmacological and biological activities.

Materials and Methods

Plant material: The seeds of *Abroma augusta* (2 kg) were purchased from the local market, Qissa Khawani Bazar, Peshawar, Pakistan. The identification was confirmed by Prof. Dr Jahandar Shah, plant taxonomist, Islamia College, Peshawar, University of Peshawar, Pakistan.

Extraction of oil: The seeds were pulverized into powder and extracted with *n*-hexane in Soxhlet apparatus. The solvent was evaporated at low temperature under reduced pressure in rotary evaporator to obtain the oil (100 g).

Antifungal activity: Antifungal activity of the oil was evaluated by agar tube dilution method (Atta-ur-Rehman *et al*., 1995). The oil (24 mg) dissolved in sterile DMSO (1.0 ml), served as stock solution. Sabouraud dextrose agar (SDA) (4 ml), was dispensed into screw cap tubes which were autoclaved at 121°C for 15 min and then cooled to 50°C. The non-solidified SDA media was poisoned with stock solution (66.6 µl), giving the final concentration of 400 µg of the oil/ml of SDA. Each tube was inoculated with a piece (4 mm diameter) of inoculum removed from a 7 days old culture of fungi. For non-mycelial growth, an agar surface streak was employed. Inhibition of fungal growth was observed after 7days of incubation at 28±1°C. A control experiment with test substance (medium supplemented with appropriate amount of DMSO) was carried out for verification of the fungal growth.

Phytotoxic activity: Phytotoxic activity of the oil was tested against the *Lemna aequinoctialis* Welv. (McLauglin *et al*., 1991). The medium was prepared by mixing various constituents in 100 ml distilled water and the pH was adjusted (5.5-6.5) by adding KOH solution. The medium was then autoclaved at 121°C for 15 min. The oil (15.0 mg) dissolved in ethanol (1.5 ml) serving as stock solution. Nine sterilized flasks, three for each concentration, were inoculated with 1000 µl, 100 µl and 10 µl of the stock solution to give the final concentration of 500, 50 and 5 ppm respectively. The solvent was allowed to evaporate overnight under sterile conditions. To each flask, medium (20 ml) and plants (10), each containing a

rosette of three fronds, of *Lemna aequinoctialis* Welv., were added. One other flask supplemented with solvent and reference growth inhibitor (Paraquate), served as negative control. All flasks were plugged with cotton and kept in the growth cabinet for 7 days. The number of fronds per flask were counted and recorded on day seven.

Antibacterial Activity: The oil was screened against various human pathogens including *Corynebacterium diphtheriae, Escherichia coli, Klebsiella pneumoniae, Proteus morganni, Pseudomonas aeruginosa, Salmonella typhi, Shigella boydii, Staphylococcus aureus* and *Streptococcus pyogenes* by agar well diffusion method (Atta-ur-Rehman *et al*., 1991).

Brine-shrimp Cytotoxicity: *Artemia salina* (brine-shrimp eggs) were used to determine the cytotoxic activity of the oil (Meyer *et al*., 1982).

Insecticidal activity: *Tribolium castaneum, Sitophylus oxyzae, Rhyzopartha dominica* and *Trogoderma granarum* were used to determine the insecticidal activity of the oil (Naqvi and Parveen, 1991).

Results and Discussion

To the best of our knowledge and from literature search, no earlier scientific studies have been undertaken to evaluate the therapeutic values of *Abroma augusta* Linn seed oil. Only `Minofil', a herbal formulation containing *Abroma augusta* as one of the ingredients has been studied for its value in the treatment of post menopausal syndrome (Nanda, 1997). The current study was designed with a view to explore the seed oil of this plant for some new biological effects to be used in herbal remedies. The seed oil of *Abroma augusta* Linn. was screened for various *in vitro* biological activities including antifungal, antibacterial, insecticidal activities, phytotoxicity and brine-shrimp cytotoxicity.

Antifungal activity of the oil was tested against *Trichophyton schoenleinii, Pseudallescheria boydii, Candida albican, Aspergilus niger* (human pathogens), *Microsporum canis, Trichophyton simii (animal pathogen). Fusarium solani var. lycopersici, Macrophomina phaseolina* (plant pathogens). Growth in the medium containing the oil was determined by measuring the linear growth (mm) and growth inhibition (%) was calculated with reference to the negative control. The results (Table 1) indicated that the seed oil of *Abroma augusta* Linn. posses a moderate activity against human and animal pathogens but no significant activity of the extract was observed against the plant pathogens. The highest inhibition effects were found for *Trichophyton schoenleinii* (56%) (human pathogens) and *Microsporum canis* (50%) (animal pathogen). The oil did not exhibit appreciable activity against the rest of fungi. This means that the seed oil of *A. augusta* Linn. has the potential to be an antifungal agent against *Trichophyton schoenleinii* and *Microsporum canis*. Further investigations must be performed to examine its antifungal properties at a higher concentration. The discovery of a potent herbal remedy that is safe will be a great advancement in fungal infection therapies. It is vital for systemic fungal infections that are usually in immuno-compromised patients as toxicities induced by commercial antifungal drugs are often observed in these patients due to the high dosage and prolonged therapy (Somchit *et al*., 2003).

Table 1: Susceptibilities of different fungi to *Abroma augusta* Linn. seed oil

	Linear Growth (mm)			
	----------		Inhibition	
Name of Fungi	Sample	Control	(%)	Standard Drugs
Human pathogens				
Trichophyton Schoenleinii	20±1.8	45±2.1	55.55	Miconazole Ketoconazole
Pseudalleschena boydii	30±2.3	55±3.0	45.54	Miconazole Ketoconazole
Candida albicans	50±3.1	70±3.7	28.57	Miconazole Ketoconazole
Aspergilus niger	37±2.6	60±3.8	38.33	Amphotericine-B
Animal pathogens				
Microsporum canis	25±3.6	50±4.1	50	Miconazole Ketoconazole
Trichophyton simii	40±2.1	60±3.8	33.33	Miconazole Ketoconazole
Plant pathogens				
Fusarium solani Var. *Lycopersici (Tomato)*	30±1.6	50±4.1	40	Benlate
Macrophomina phaseolina	60±5.6	60±4.3	0	Benlate

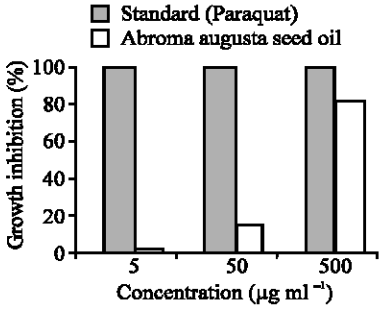

Fig. 1: Phytotoxic activity of *Abroma augusta* Linn. seed oil

Results of the Phytotoxic activity of the seed oil of *Abroma augusta* Linn. on *Lemna aequinoctialias* Walv. was interpreted by analyzing the growth regulation in percentage, calculated with reference to the negative control. Paraquate was used as standard inhibitor. The results (Fig. 1) showed that the oil posses remarkable phytotoxic activity against *Lemna aequinoctialias* Walv.

and inhibited the growth of plant by 82.35% at a concentration of 500 μg ml^{-1}. However, no appreciable effect was observed at lower concentrations. This phytotoxic activity is not surprising, since some of the oil components that account for 1% or greater of the oil, such as eugenol (Gant *et al*., 1975 and Bessette, 2000) ledol and viridiflorol (Terrom, 1994); are known to be phytotoxic.

The *Abroma augusta* seed oil did not display remarkable results for antibacterial, insecticidal activities and Brine shrimp cytotoxicity.

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